Homework 3 – Linux Containers

ECE 530 – Introduction to Cloud Computing

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Docker on VMs

Objectives
The homework emphases on the effectiveness of using Linux Containers through Docker. Docker is a great platform for easy to maintain, highly configurable instances. You can set it up and run it in milliseconds, and you can create globally accessible services.

The objective of this lab is to create a Dockerfile that can build images automatically. A Dockerfile is a text document that contains all the commands that you would execute to build a Docker image manually. For more information about Dockerfiles please visit https://docs.docker.com/reference/builder/

For this homework you will need to deploy a distributed database based on Linux containers. Your deployment must contain at least two containers and therefore at least two database instances. The instances must be connected to each other and contain part of the data. You can select any open source distributed database that you like. Some examples are Cassandra, MongoDB, CouchDB, PostgreSQL etc.

Examples
A good tutorial on Dockerizing apps and databases (like CouchDb, PostgreSQL, Riak etc):
https://docs.docker.com/samples/
MongoDB with Docker in 9 steps
https://medium.com/@gargar454/deploy-a-mongodb-cluster-in-steps-9-using-docker-49205e231319#.9yufqhtdo

Note that these examples are for single instances, and they are very descriptive on how to create a Dockerfile. Once you have multiple instances you have connect them.

Learning Outcomes
The objective of this lab is for each student to learn

1. how to use the Docker API to deploy Linux Container
2. how work with Docker on top of a VM (vertical virtualization).
3. how to automate the deployment through Dockerfile
4. Understand at least one Distributed Database (DB)
5. Learn how to scale a multi-container deployment.

System
This lab can be performed in any Linux VM. If you do not have a VM please contact the instructor to provide you one. However, it is fairly simple to install a Hypervisor and provision a new VM. Most Linux OSs come with packages for Docker. For example in Ubuntu or CentOS based OS you need to run

```
apt-get -y install docker.io
```

The simplest OS to use for Docker image is Ubuntu again.

```
docker pull ubuntu
```

Grading

The following is how the homework will be graded

- 40% will be given for correctly compiling a single instance DB on Docker
    - add some data to the database
- 40% if you manage to connect two or more containers
- 20% if you showcase that the deployment works perfectly
    - showcase that your data are replicated
- +10% if you do something that impresses the instructor based on Docker

Please start as early as possible as this lab requires some learning curve. The instructor will (a) test the deployment in the class or during office hours and (b) use the report for grading.

Groups & Submission

Each group must submit a single report of their work. The report must contain the Dockerfile in the Appendix and several screenshots that proves that the deployment is functional. The report must contain all group member names in the front page. The groups can contain up to 3 students. No late submissions will be allowed for any reason.

Good luck!